

THE ECONOMIC ANALYSIS OF REGULATING RETAINED WATER IN MEAT
& POULTRY PRODUCTS: FINAL RULE

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Executive Summary:

This analysis, which deals with the estimation of expected benefits and costs and the regulatory impact of this rule, was conducted to meet the requirements of Executive Order 12866 and the Regulatory Flexibility Act. Because the final rule has been designated "economically significant," having a potential annual economic impact of

\$100 million or more, the Office of Management and Budget has reviewed it for compliance with Executive Order 12866. This final regulatory impact analysis (FRIA) confirms the basic findings of the preliminary regulatory impact analysis (PRIA) which was published as Appendix B of the proposed rule (at 63 FR 48969).

The Agency received few comments on the PRIA and none on the methodology or basic findings. Some commenters expressed their preferences for one or more of the regulatory options discussed in the PRIA. Some used information in the PRIA to support their positions. Others suggested, without providing data, that the rule would be too costly. A few suggested that the benefits might be more substantial than Agency estimates indicated. As reported in the preamble of the final rule, consumer advocates argued that reduced retained water could lead to reduced spillage and contamination in the home. FSIS is therefore adopting the principal findings presented in the PRIA, including those regarding the estimated fixed and variable costs associated with the rulemaking option adopted in the proposed and final rules. This FRIA provides additional discussion of the effects of the rule, including the direct and indirect benefits, the value to consumers of labeling information on retained water. It

also contains an analysis of the effects on demand of possible price increases for poultry products caused by efforts to establish limits for retained water and for labeling the products. This analysis replaces the discussion of aggregate market effects that appeared in the PRIA.

The FRIA indicates that small establishments are unlikely to be adversely impacted by the requirement of this final rule to reduce retained water. In estimating the costs and benefits of the rule, it is assumed that the costs will be incurred from the effective date of the rule and the benefits will be realized from the same date.

This Final Regulatory Impact Analysis (FRIA) shows that the rule could lead to a substantial reduction in the amount of retained water in poultry which could have a significant economic impact on the poultry industry. Under the final rule, raw, single-ingredient meat and poultry products will not be permitted to contain water resulting from post-evisceration processing unless the establishment demonstrates that water retention is an unavoidable consequence of the process or processes used to meet applicable food safety requirements. There are three types of costs associated with this final rule. These costs are associated with: establishing retained water levels;

reducing retained water to such levels; and revising product labels to indicate the presence of retained water. Product labels will have to indicate the percentage of retained water. Consumers can use this labeling information in choosing among products. The exercise of consumer choice among products with varying levels of retained water could induce competition among firms that would lead them to invest in new technologies that would reduce retained water.

Most of the cost of this final rule will be borne by the poultry industry. Most, if not all, raw poultry products now contain retained water whereas only a few meat byproducts or organ meats now contain retained water. Most costs experienced by the livestock products industry will be associated with voluntary decisions to use new or different processes to meet food safety requirements that may result in some level of unavoidable retained water.

This analysis estimates costs the poultry industry will incur to meet this new regulatory requirement. If establishments are able to demonstrate that current retained water levels are unavoidable consequences of the processes used to meet applicable food safety standards, establishments will not incur costs for reducing retained water. The establishments will incur costs for

establishing limits for the retained water levels and costs for revising product labels. The costs of establishing limits for the poultry industry are estimated to be \$1.5 million (in 1998 dollars). Label revision costs are estimated to be \$18.4 million (in 1998 dollars) if all raw, single-ingredient poultry continues to contain retained water.

To the extent that poultry establishments cannot demonstrate that current retained water levels are necessary for achieving applicable food safety standards, significant costs could be incurred as establishments modify processes to reduce retained water levels. Reducing retained water could entail a wide range of processing modifications, depending on the type of chilling equipment currently used and the amount of retained water that would have to be removed. The analysis estimates that the average retained water for chicken, as a percentage of net weight is probably in the 5.0 to 6.5 percent range. The average retained water for turkey, as a percentage of net weight is probably in the 4.0 to 4.5 percent range.

If this final rule induces actions by the poultry industry to remove a substantial portion of the existing retained water, then the costs to the industry could exceed \$100 million (in 1998 dollars). FSIS's retained-water

tests on whole broilers have shown that retained water varies considerably from establishment to establishment. For 13 establishments operating under the 8-percent regulatory limit for whole broilers, the average retained water at the end of the drip line ranged from 4.72 to 7.32 percent. FSIS believes that establishments operating at the higher end of this spectrum have been targeting the old regulatory limit and establishments operating at the lower end of this spectrum are, most likely, operating at or near the minimum necessary to meet existing chilling requirements, which are food safety standards. For this reason, FSIS does not expect to see costs approaching the \$100 million level. However, FSIS also recognizes that the retained water levels at the lower end of the spectrum could be tied to purchase specifications or other factors and may not be true minimum levels. Therefore, this analysis has estimated the costs for all poultry establishments of removing a substantial portion of the current levels of retained water.

This FRIA estimates that using additional drain time to reduce retained water in poultry by 4 to 5 percentage points (from 5-6.5 percent to 1-1.5 percent) in all establishments could cost up to \$94 million (in 1998 prices) in one-time fixed costs. Annual recurring costs

are estimated at \$10 million (in 1998 prices). These cost estimates are based on situations where inspected establishments were required to drain retained water that exceeded regulatory limits. FSIS program personnel do not believe it is feasible to eliminate all retained water from immersion-chilled poultry. Thus, if establishments must eliminate a substantial portion of retained water, they will incur the costs of minimizing the water plus the costs of establishing the minimum or minimums and labeling costs. The costs of the final rule, however, are highly dependent on the level of retained water that is necessary to meet existing food safety requirements. That level will remain unknown until established by well-designed studies. However, as discussed above, FSIS predicts that only those poultry establishments operating at the higher end of the retained water spectrum would have to substantially reduce their retained water levels. This prediction is based on data showing that establishments can control retained water and data showing that some are controlling retained water so as to be at or near the applicable regulatory limit.

This final rule fills a regulatory void created by the July 23, 1997, U. S. District Court decision in Kenney v. Glickman to set aside the water retention limits for whole birds. The regulatory limits that the Court set aside did

not have adequate analytical support. Regulatory limits are necessary to protect the public from economic adulteration. Preventing economic adulteration provides a consumer benefit. Consumers would also benefit from the additional information that would be provided by the labeling requirement. The information on retained water should lead to better-informed purchasing decisions.

The final rule will also provide affected establishments with the flexibility they need to choose the most appropriate means for implementing HACCP plans for assuring the safety of raw product. For example, under the final rule, both meat and poultry carcasses will be allowed to retain absorbed water if data show that such water is unavoidable in order to assure compliance with the pathogen reduction performance standards for Salmonella. In addition, by replacing certain existing command-and-control requirements with HACCP-consistent performance standards, the final rule will allow increased flexibility, which should reduce the costs for HACCP implementation. This analysis does not attempt to quantify the benefits of the increased flexibility that results from eliminating command-and-control requirements. The final rule will also remove certain recordkeeping and reporting requirements.

I. Introduction

FSIS is limiting by regulation the amount of retained water raw meat and poultry products may contain. The final rule will, among other things, amend the meat and poultry inspection regulations governing water retained by carcasses and parts of carcasses as a result of post-evisceration washing and chilling necessary to ensure product safety and wholesomeness. The amended regulations will apply the same retained-water standard to both red meat and poultry. Meat and poultry carcasses and parts will not be permitted to retain water resulting from post-evisceration processing unless the establishment demonstrates that water retention is an unavoidable consequence of the processing used to meet existing food safety requirements. Under the final rule, raw meat and poultry products that retain water will have to be labeled to indicate the maximum amount of retained water that may be present as a percentage of product weight.

In addition to revising the regulations controlling retained water, FSIS is also revising the poultry regulations covering thawing procedures, water use and reconditioning, and certain other operating procedures. These other regulations are being revised to improve consistency with the Pathogen Reduction/Hazard Analysis and

Critical Control Point Systems (PR/HACCP) regulations, eliminate "command-and-control" features, and reflect current technological capabilities and good manufacturing practices. By replacing command-and-control requirements with HACCP-consistent performance standards, the final rule will allow increased flexibility and should reduce costs for HACCP implementation. Removing some command-and-control regulations will also eliminate some existing recordkeeping and reporting burdens. This analysis does not attempt to quantify the benefits of the increased flexibility that results from eliminating command-and-control requirements.

II. Need for the Rule

Response to Court Decision

The regulations controlling retained water in poultry carcasses have consisted of three major components: (1) a performance standard requiring washing, chilling, and draining practices that will minimize water absorption and retention at time of packaging; (2) limits for maximum retained water in birds that will be packaged as whole carcasses; and (3) limits for maximum retained water in birds that will be ice-packed or cut up prior to packaging. The performance standard is interpreted as minimizing the

water that is absorbed and subsequently retained, i.e., it is not interpreted as requiring minimization of both water absorption and water retention. In implementing the standard, FSIS concludes that the performance standard is met when retained water is under the maximum limits.

Until the Court case referred to below, the maximum retained water for most whole chickens (those 4.25 pounds or under) was 8 percent. The maximum retained water for chicken that is ice-packed or subsequently cut up into parts has been 12 percent. The 12-percent limit is based on the premise that chicken parts from whole birds with water levels between 8 and 12 percent will reach the 8 percent level by the time the parts are packaged. The analogous limits for turkey are similar but have included unique limits for 12 different carcass weight categories. The maximum retained water limits for whole turkey ranged from 4.3 to 8.0 percent, depending on weight. The corresponding limits for cut-up turkey ranged from 5.3 to 9.0 percent. The maximum retained water for whole ducks, geese and guineas was 6 percent; the same limit that applied to chickens over 4.25 pounds.

The U.S. District Court, in the matter of Kenney v. Glickman, finding that the analytical support for the existing water retention limits for whole birds was

insufficient, vacated the regulation setting out the limits. Thus, in the wake of the decision, there have been no regulatory criteria to determine whether retained water has been minimized in chilled or frozen whole birds. FSIS is mandated to prevent the distribution in commerce of meat or poultry products that are adulterated or misbranded. Under the meat and poultry statutes, a product is adulterated if, among other circumstances, a substance has been added to or mixed with the product to increase its bulk or weight or make it appear of greater value than it is. Thus, if water has not been minimized, the product may be considered adulterated. Such product may also be considered misbranded. Without limits on retained water, FSIS cannot adequately protect consumers from adulteration and misbranding due to excessive retained water in whole birds.

Eliminate Inconsistency

In addition to the situation created by the July 1997 Court decision, FSIS sees additional need for regulatory action. With respect to the regulation of retained water, there are differences or inconsistencies both between the livestock and poultry industries and within the existing regulatory framework for poultry. FSIS allows poultry to

retain water absorbed during processing as an unavoidable result of traditional chilling practices. There is no comparable allowance for meat. The regulatory definitions for economic adulteration "by substances added so as to increase bulk or weight or make a product appear better or of greater value than it is" are identical for meat and poultry. Although the Secretary of Agriculture has the authority to apply the adulteration provisions differently, FSIS believes there can be more consistency between the livestock and poultry industries in how the adulteration provisions are applied to retained water in raw products. The traditional differences in chilling practices have led to a situation where the weight of a meat carcass usually decreases during chilling while the weight of a poultry carcass increases.

The Department promulgated regulations limiting water absorption in poultry in 1959, 1961, and 1970 (December 1, 1959, 24 FR 9566; July 19, 1961, 26 FR 6471; October 7, 1970, 35 FR 739). The regulations that this final rule replaces contain a standard of performance that calls for minimization and maximum retained water limits for poultry carcasses based on carcass weight and intended use. Under the enforcement framework for these regulations, a poultry establishment was "minimizing" retained water when it was

operating within the existing limits. FSIS is aware that not all establishments have really been minimizing retained water. Data analyzed for this PRIA show that some poultry establishments have been controlling their processes to retain the maximum allowed amount of water. While this is considered acceptable in the sense that product is not adulterated, it is not consistent with a regulatory intent to minimize. However, it may be consistent with food safety objectives to reduce pathogens.

The existence of the 12-percent limit for cut-up chicken is in itself inconsistent with the concept of minimization. Many establishments pack both whole- and cut-up chicken. In meeting the 8-percent limit for whole birds, they demonstrate that their minimum is below 8 percent. The 12-percent limit serves as an opportunity to maintain water levels in cut-up poultry. The 12-percent limit is also available as default when the 8-percent limit is not achieved. An establishment can divert birds to cut-up operations when they fail the whole bird limit.

Impact on Small Entities

The final rule should not have a significant impact on a large number of small businesses. Almost half of all federally inspected poultry slaughter establishments are

large business entities, based on the Small Business Administration size criterion of more than 500 employees.

These establishments, and indeed most poultry establishments, use immersion chilling to meet the existing chilling requirements for poultry, e.g., 9 CFR 381.66(b)(2) requires that poultry carcasses under 4 pounds must be chilled to 40 °F within 4 hours following evisceration. It follows that, for most poultry establishments, the unavoidable retained water amount is the minimum level that can be reached with existing immersion chiller equipment while still meeting the chilling requirement. FSIS recognizes that this minimum must be established within practical limits for operating parameters such as drip time and chiller water temperature. The industry already has information concerning the chiller variable settings that minimize water retention. Therefore, the poultry industry can establish water retention limits for various chiller systems with minimal costs. FSIS also recognizes the possibility that some poultry establishments may have to use anti-microbial interventions that result in higher levels of retained water to meet the Salmonella standards than they do to meet the existing chilling requirements.

Fifty to 60 poultry slaughter establishments process under a million birds annually. Many of these smaller

operations do not use continuous immersion chillers. They use ice or slush to meet the existing chilling requirements. Few, if any, would have to reduce the current level of retained water. The establishments most affected by this final rule are the firms operating immersion chillers in a manner that targets the maximum allowable retained water.

This final rule should not have a significant impact on the meat industry because that industry is already achieving zero-percent retained water. This final rule, however, provides an alternative for establishments that are having or will have trouble meeting the Salmonella performance standards. These establishments could use a full range of anti-microbial rinses or hot-water rinses without having to worry about meeting a zero-percent retained-water limit. If they can demonstrate that they need a non-zero limit to meet the Salmonella standards, they can use the flexibility provided by the final rule and establish a new water limit as long as they state the maximum percentage of water absorbed and retained on product labels.

Of the meat products affected by this final rule, edible organs prepared in slaughtering plants are most likely to retain water. Of the 1,200 establishments that

prepare these products, about 85 percent are small. Most of these establishments will have to label their products to indicate the maximum retained-water percentage in the products.

III. Background

Before this final rule, no meat regulations prescribed maximum limits or otherwise addressed retained water in raw meat products. Because there have been no regulatory limits, FSIS has enforced the adulteration provision of the FMIA with the understanding that any level of retained water is adulteration. FSIS has allowed cold water spray chilling systems as a supplement to air chilling of beef and hog carcasses under the procedures outlined in FSIS Directive 6330.1. Under those procedures, FSIS inspectors have monitored establishment-operated quality control systems to make sure that the total weight of a group of spray-chilled carcasses is not greater than the total pre-wash weight of the same carcasses. Thus, while an individual carcass may have shown a weight gain, FSIS enforced a standard of zero-retained water for groups of beef or pork carcasses for spray chilling systems. In contrast, FSIS has not required establishments to closely monitor water when using pathogen reduction methods, such

as pre-evisceration carcass sprays or steam vacuum processes, on the kill floor.

FSIS has operated an extensive program to assure compliance with existing limits for retained water in poultry. Retained water can result from both carcass washing and carcass chilling, i.e., the post-evisceration washing and chilling processes. The procedures for conducting retained water tests for poultry are outlined in Part 10 of the Meat and Poultry Inspection Manual. The standard procedures instruct the inspector to tag and weigh a sample of 10 birds from the eviscerating line before the final carcass wash. The final carcass wash occurs before birds enter the chiller. The same 10 birds are then weighed after the chiller at a point specified in the establishment's water control procedures as outlined on FSIS Form 528. The most common point is the end of the drip line or the last accessible point on the drip line. The test procedures are the same regardless of whether the whole bird or cut-up limits apply.

Under standard procedures, inspectors conduct one test each shift. Many establishments have been tested once each week on the basis of their history of compliance. Under the standard procedures for controlling water retention, test birds must not be allowed extra draining time, i.e.;

they must reflect the production lot. The standard procedures for an establishment may specify that the test birds be drained for a specific time if production is all drained for the same amount of time. For example, one establishment specifies that test birds are to be drained four (4) hours before being weighed. When water limits are exceeded, product is retained.

Violations have occasionally occurred and appear to be a function of how close to the regulatory limit an establishment has been operating. Existing data indicate that some establishments have been controlling their processes way below the limits and have never come close to a violation. The data reviewed for this analysis show that most establishments have not had water violations or have rarely exceeded existing limits. A few, however, appear to have targeted the regulatory limit and frequently have written off product retention by FSIS inspectors as an extra operating expense. In the data examined for this analysis, retained product required additional drain times ranging from 3 minutes to 12 hours.

FSIS's retained water control program has been a relatively resource-intensive effort. In a poultry establishment with two shifts and two chiller systems, FSIS has conducted up to four 10-bird tests each day. Each test

takes from 40 to 60 minutes for selecting, tagging, and weighing birds and then recording results and making necessary calculations. Even with reduced testing in many establishments, it appears reasonable to estimate that FSIS has conducted between 300 and 400 retained-water tests each day. Assuming a 260-day work year, FSIS conducted from 78,000 to 104,000 tests annually. At 40 to 60 minutes each, the annual testing represents from 25 to 50 staff years of 2,080 hours each. The Agency also expended an estimated 560 staff-hours each year reviewing changes in establishment washing, chilling, and draining procedures. These estimates do not include the cost of addressing violations.

FSIS intends to pursue a new water control program that can incorporate wholesale or retail sampling to identify establishments that may be exceeding water limits and then target resources to conduct follow-up testing to confirm compliance or noncompliance. FSIS will use a standard oven-drying method, described in Appendix A of the final rule, to measure the amount of water in sampled products against what is considered the natural water content of the product.

In its 1980 proposed rule "Net Weight Labeling" (45 FR 53002; August 8, 1980), FSIS considered a "building-block"

approach to net-weight compliance that was then being reviewed by the Codex Alimentarius Commission. This approach, as described in the 1980 proposal, "would be modeled on a statistical limits-of-variance technique developed by Switzerland for application to imported, prepackaged foods. Inspectors would make limited inspections for compliance at retail. If the sampling technique indicates a noncompliance problem, additional inspection of the same product would be made at retail and further back in the marketing chain, including at processing plants. If the problem continues following notification of the producers, a more precise enforcement test would be applied" (45 FR 53022). An alternative that lends itself to this type of approach will rate high on the criterion for an efficient, equitable enforcement system.

IV. Description of the Final Rule

The final rule establishes a single retained water standard for all raw, single ingredient meat and poultry products. This standard allows retained water only if that water is an unavoidable consequence of the process or processes used to assure compliance with applicable food safety requirements. The establishment preparing the product must be able to demonstrate this fact with data

collected under a written protocol that must be available for review by FSIS. The presence of any retained water in the product must be identified on product labeling.

These requirements affect only single-ingredient, raw, whole, cut-up, or ground meat and poultry carcasses and parts, including edible organs and other edible meat and poultry byproducts. They do not affect raw products with labeling that includes a list of ingredients or nutrition labeling, such as pre-basted frozen turkeys or individually quick frozen (IQF) poultry parts labeled to indicate the addition of basting solutions.

The final rule also modifies other existing regulations related to water use and chilling requirements. For example, the final rule removes a requirement that establishments must file a description of chilling and freezing procedures with the inspector-in-charge (IIC). At the same time, the final rule removes the requirements that the establishment submit written notice of any adjustments to washing, chilling, and draining methods before any changes are made and provide FSIS data showing the adjustments are effective in meeting existing water limits. These modifications will reduce recordkeeping and reporting burdens.

The final rule also removes specific requirements concerning the amount of fresh water intake required in the first section of a continuous chilling system. The existing regulations require a minimum of one-half gallon per frying chicken and proportionately more for other classes of poultry, including not less than one gallon per turkey. The potential for lowering water costs is unknown. The general requirements for using potable water and continuous overflow from one section of the chiller to the next will remain. The requirement for continuous overflow would appear to limit the opportunity for reduced water use.

The regulations on water intake were established at a time when FSIS was assuming responsibility for controlling pathogen levels and frequently did so by imposing design requirements. In 1978, the Agency published a final rule (43 FR 14043; April 4, 1978) that would have reduced water intake requirements by 50 percent when chlorine levels in the incoming water were at least 20 parts per million. The final rule was subsequently withdrawn. Of concern during the rulemaking were studies by USDA and the Virginia Polytechnic Institute and State University (VPI) that showed that bacteria levels increased as intake water was reduced. While the relationship of water intake and

pathogen levels remains a public health concern, FSIS is no longer attempting to design protection using command-and-control regulations. Under the Pathogen Reduction/HACCP final rule, establishments are required to meet pathogen reduction performance standards. This current final rule is a performance-based standard that will lead to retained water levels that are necessary to meet pathogen reduction requirements and other food safety standards. The final rule is consistent with FSIS objectives of setting performance standards and moving away from such design requirements as the minimum of one-half gallon of fresh water intake per chicken. It is now industry's responsibility to establish how water intake relates to both retained water and pathogen levels.

The final rule also removes prescriptive requirements for water reconditioning systems for poultry chillers. This change will not have an impact because reconditioning systems have not proven feasible in commercial operations.

FSIS is retaining the existing requirements mandating that the internal temperature of poultry carcasses be lowered to 40 °F. or less within a specified time until these requirements can be addressed by a future rulemaking. The Agency also will continue to require that each establishment provide scales, weights, identification

devices, and other supplies necessary to conduct water tests. While the Agency envisions a compliance-sampling program using the deviation from an expected level of total water content as a screening system, the Agency will still use the existing sampling system to confirm potential compliance problems.

The poultry regulations discussed above concerning water use, chilling requirements, and water retention are all contained in 9 CFR 381.66 (temperatures and chilling and freezing procedures). This final rule also removes several existing regulations from 9 CFR 381.65 that now address general operating procedures, many of which are not related to water use or chilling procedures. Operating procedure requirements that are removed or revised under this final rule include the following:

- specific requirements that prescribe the nature of opening cuts for evisceration,
- the requirement to remove kidneys from mature poultry,
- requirements pertaining to the handling and storage of materials that could adulterate product,
- requirements for containers, packaging, and covering materials,
- requirements on removing offal from establishments,

- requirements prescribing how to thaw frozen poultry and drain ready-to-cook poultry,
- requirements on how establishments can chill parts of carcasses, and
- requirements related to harvesting detached ova.

The regulations that are being eliminated are either regulations that are overly prescriptive, command-and-control regulations, such as those defining opening cuts or regulations that are now redundant with HACCP, e.g., the removal of kidneys. The reason for removing the kidneys of mature chickens and turkeys is that they are a source of cadmium, which can accumulate in the human liver and kidneys and cause acute or chronic health problems. This is a "food safety hazard reasonably likely to occur" that establishments will identify in their hazard analyses and control through their HACCP systems. Thus, a regulatory requirement for their removal would be redundant with the HACCP regulations.

V. Analysis of Existing Data on Retained Water

Water Data from Poultry Plants

As discussed above, most raw, single-ingredient meat products are not currently allowed to contain any retained water. This analysis assumes that these meat products will

continue to be produced without retained water. Products that are packed in water or may retain water are already labeled to indicate such information. Chitterlings (swine intestines) are washed and chilled before shipment and are packaged with water. Certain organ meats and meat from ears and tails are also washed and chilled using water. A few establishments chill beef cheek meats in water, a process that may result in the absorption of water. The product is labeled to indicate the maximum percentage added water it may contain to alert buyers to the fact that the product may weigh more because of the chilling process. The Agency does not have data on the volume of meat products with retained water or data on the current levels of retained water. These products do not, however, represent a major portion of meat industry production.

In order to estimate the current level of retained water, in early 1997, the Agency's headquarters staff informally requested field offices to forward readily available water data from poultry plants. The material assembled varied from region-to-region and plant-to-plant. The field offices did not use a standard method to summarize available data. In some cases, the individual establishments were identified; in other instances, all plant identification was removed. The allowable water,

i.e., the applicable regulatory limit, was not always readily discernible. The data covered the period of January through May 1997. Most of the data was included on the Daily Moisture Records (FSIS Form 549 or its replacement Form 6310-1). These records record the pre-wash and post-chill weight of each individual bird for each 10-bird test. Five 10-bird tests are recorded on each record.

While the data assembled was not systematically collected, it is representative of the amount of water currently absorbed and retained during the washing and chilling process as measured by existing FSIS water test procedures. An analysis was conducted using all the data that met the following criteria for establishments slaughtering young chickens:

- Minimum of twenty 10-bird tests (200 birds).
- Existing regulatory limit available.
- All available test data collected under a single applicable limit.
- All results clearly legible.
- Establishment identified (to connect water data with production).

The data from 33 establishments slaughtering young chickens met the above criteria. These 33 establishments represented 17.5 percent of FY 1996 production. Within the 33, 19 establishments were operating under the 12 percent water limit that was applicable to cut-up and ice-pack poultry. These 19 establishments accounted for 9.11 percent of the total FY 1996 production and 52 percent of the production within the 33 establishments.

Thirteen establishments were operating under an 8-percent water-absorption limit during the period the data was collected. The 8-percent limit applies to whole carcass pack chickens or frozen chickens that are 4.25 pounds or less. The 13 establishments represented 7.95 percent of FY 1996 production. One establishment was operating under the 6 percent limit for whole chickens over 4.25 pounds.

Among the 33 establishments, 48 percent of the young chickens were being processed under the water limits for whole birds. Today, the National Broiler Council estimates that only 10 percent of broilers are "marketed" as whole birds. Two factors explain this difference. First, if any birds in a production shift are to be shipped whole, the entire shift is subject to the whole bird limit. Second, some birds are shipped whole and then cut up in a second

establishment conducting further processing. The 10 percent "marketed" as whole birds include product destined for retail and food service establishments.

The 13 establishments operating under the 8-percent limit had an average absorbed water level of 5.81 percent and a production based weighted average of 5.68 percent. Individual establishment averages ranged from 4.72 to 7.32 percent. These percentages represent percentage gain relative to the carcass weight before the final carcass wash. The individual plant averages were calculated by combining all available water tests from all shifts and all washer/chiller systems. Averaging all water test results in this manner assumes that each test represents an equal amount of production. Many plants have more than one chiller system and multiple shifts. Production may not be equally distributed across all shift-chiller combinations.

The 19 establishments operating under the 12-percent limit had an average absorbed water level of 9.11 and a weighted average of 9.02 percent. As above, these percentages represent the percentage gain relative to the carcass weight before the final carcass wash. While 18 of these establishments had absorbed-water levels close to 8 percent or above, one establishment had an average water level of 5.37, based on sixty 10-bird tests (600 birds)

conducted from January through April 1997. The establishment operates two systems, one-averaged 5.61 percent, the other 5.14. All the daily records were checked to indicate the establishment was producing cut-up poultry.

In addition to the data analyzed above (33 establishments), the 1997 data included water tests from three young chicken establishments that processed both whole birds under the 8 percent limit and cut-up chickens under the 12 percent limit. For these 3 plants, there were at least 20 tests at each level. The results are shown in the following table:

Establishment	8 Percent Limit	12 Percent Limit	Difference
A	6.42	7.67	1.25
B	5.26	6.15	0.89
C	5.94	7.30	1.36

An analysis of variance procedure indicated that, after accounting for variability between plants, there is a statistically significant difference (confidence greater than 99%) between the percentages of water gain at the two regulatory limits. It follows that these establishments are not really minimizing retained water when operating under the 12-percent limit because they have lower retained water when processing whole birds. The difference does not, however, approach 4 percent.

Because there are 12 different water limits for different sizes of turkeys, the approach to analyzing existing data had to be different. It is common to see three different water limits for a five-test series recorded on the Daily Moisture Records. The data from

turkey establishments was sorted using the following two criteria:

- Minimum of ten 10-bird tests conducted under limits applicable to turkeys packaged as whole birds.
- Establishment identified.

A review of the existing data identified six establishments that were operating under the limits for whole-carcass packing procedures. These six establishments represented 12.7 percent of federally inspected turkeys in FY 1996. An estimated 40 percent of all turkeys are marketed as whole birds. Because of the 12 different limits for whole turkeys depending on weight, this analysis did not attempt to estimate absorbed water for different sizes of birds.

The six turkey plants had an average absorbed water level of 4.39 percent and a weighted average of 4.74 percent. Individual plant averages ranged from 1.91 to 5.53 percent. This analysis did not attempt to estimate water levels for cut-up or ice-packed turkeys.

The review of Daily Moisture Records identified a couple of potential issues that should be addressed by comments. First, some of the highest water results occurred when line speeds were running too slow for the established water control procedures. Since slowing line speeds may be

a response to higher pathogen levels, there is some indication that water pick-up and pathogen levels may be inversely related under some conditions. In one case, a company conceded that it could not pass the 8-percent whole bird water limits at certain lower speeds and agreed to divert birds to cut-up operations when the line speed dropped to a certain level. By diverting the birds to cut-up, the establishment avoided the process of conducting a 50-bird test to establish the necessary drain time to meet the 8 percent limit. Another plant noted that slower speeds resulted in insufficient numbers of birds for proper travel through their chiller system with rocker arms.

As a second issue, the data indicate that more problems arise with very small birds, i.e., broilers in the 2 ½- to 3-pound range. Individual birds would show water pick-up in the 20 to 24 percent ranges. FSIS staff notes that eviscerating equipment sometimes causes extra large openings on small carcasses that lead to pockets of water under the skin. These birds are informally referred to as "water bags." The water test is rather meaningless for these birds if they are headed to cut-up operations because the water in these pockets drains quickly and easily at the cut-up operation.

Retained Water in Net Weight

The final rule requires that product labels indicate the percentage of net weight represented by retained water. All the data presented in the previous section refers to retained water as a percentage gain from the carcass weight prior to the final carcass wash. The same volume of retained water, expressed as a percentage of net weight, will be somewhat lower than that percentage gain because net weight includes the pre-wash carcass weight plus any absorbed water.

A second difference occurs because FSIS water tests normally occur at the end of the drip line. The exact relationship between the volume of retained water as recorded by FSIS tests and the volume of retained water in finished packaged product is unknown. Retained water in finished packaged product will be lower for several reasons. First, an establishment's handling procedures will lead to some water loss before the product is packaged and weighed. Today, only 10 percent of broilers is marketed as whole birds. Thus, many broilers produced under whole bird limits are being cut up in the originating establishment or in a subsequent establishment before being packed as finished product. Second, any product that exceeds existing limits is required to drain for a specific time as determined by program personnel. Third, the

establishment may implement draining procedures to meet a customer's purchase specifications. In these cases, the retained water included in net weight could be far less than the retained water measured by FSIS tests.

It is also difficult to compare the water data for whole birds with the data on cut-up poultry. As discussed above, available data showed whole young chickens to average 5.68 percent while cut-up young chickens averaged 9.02 percent on a production-based weighted average. The 12 percent limit on cut-up chickens was based on a premise that if poultry for cut-up averages less than 12 percent at the time of water test, it would drain to less than 8 percent during the remaining handling prior to final packaging. This does not mean that poultry destined for cut-up will drain 4 percent. It seems reasonable to assume, however, that the level of 9.02 percent will approach the whole bird level of 5.68 percent, probably ending up somewhere between 6.0 and 7.0 percent.

Allowing for some drain in the whole bird packaging process and considering the conversion to percentage of net weight, it seems likely that the average retained water for chicken as a percentage of net weight is probably in the 5.0 to 6.5 percent range. This estimate is consistent with

findings published in a study¹ conducted in 1979 by the Economics, Statistics, and Cooperatives Service (ESCS (now ERS)). That study, hereinafter referred to as the 1979 ERS study, estimated that average water pickup for six processors at the time of packaging was 5 to 6 percent. Because some product undergoes further cut-up and packaging in other establishments, the average water level leaving originating establishments is not the same as the level in customer packages.

The whole-bird data on turkeys, i.e., 4.74 percent retained water, is a better estimate for packaged turkey since 40 percent are marketed as whole birds. One would expect some additional drainage before the birds are packaged. The average retained water level for turkey, as a percentage of net weight is probably somewhere in the range of 4 to 4.5 percent.

VI. Economic Analysis of Retained Water in Meat and Poultry

This chapter examines the economic issues associated with retained water in poultry. For analytical purposes, this chapter assumes that the average retained water for all chicken is 5 percent of net weight and the average for

¹ Assessment of Proposed Net Weight Labeling Regulations, Staff Report, Prepared by the Economics,

turkeys is 4 percent of net weight. The analysis in Sections 4 and 5 concluded that the average retained water for chicken is probably between 5.0 and 6.5 percent and the average retained water for turkey is probably between 4.0 and 4.5 percent.

In FY 96, there were 7.67 billion chickens slaughtered under Federal inspection. Based on an estimated average carcass weight of 3.36 pounds, the total weight of ready-to-cook chicken was 25.8 billion pounds. If the average retained water was 5 percent, then one can view the total as 24.5 billion pounds of chicken and 1.3 billion pounds of retained water. Since the wholesale price of whole broilers was \$.6124 per pound², the chicken had an estimated whole bird wholesale value of \$15.8 billion.

In FY 96, there were 289.6 million turkeys slaughtered under Federal inspection. Using an average carcass weight of 17.9 pounds, the production was 5.18 billion pounds. The average FY 1996 wholesale price was \$.665 per pound resulting in a total wholesale value of \$3.4 billion. Using an estimated average retained water level of 4 percent, one could view the production as 4.97 billion pounds of turkey and 0.21 billion pounds of retained water.

Statistics, and Cooperatives Service for the Food Safety and Quality Service, USDA, August 1979.

²Livestock, Dairy and Poultry Situation and Outlook, LDP-M-44, ERS, USDA, August 15, 1997.

There are two ways of looking at the current situation. One is the perspective that customers are paying \$15.0 billion for the chicken and \$789.4 million for the retained water and \$3.3 billion for turkey and \$136 million for retained water. The other is that the water has no effect on the value of the poultry. In this case, the value of the chicken is \$15.8 billion and the value of the turkey is \$3.4 billion. The customer is simply not being informed that the true wholesale price of the chicken on a "zero added water" basis is \$.6446 per pound and not \$.6124. Similarly, the customer is not being informed that the true wholesale value of turkey is \$.684 per pound and not \$.665.

While the 1979 ERS study was focused on analyzing alternative net-weight regulations, the study addressed essentially the same issue as retained water when it considered drained weight labeling. The ERS study used an "added water in chicken" example to illustrate the retail price effects of dry tare versus drained weight labeling of packaged chicken. The example was a package of chicken breasts selling for \$1.20 per pound with a labeled weight of 3 pounds using a dry-tare system. The tare is the weight of any container, or wrapper, or other material not included in the stated weight of a package. This package

would cost the consumer \$3.60. If this package undergoes a water loss of 4 percent, and assuming the net weight was exact under the dry-tare system, the consumer selecting this package would be receiving 2.88 pounds of drained weight chicken and the price per pound of chicken is \$1.25 ($\$3.60 \div 2.88$ pounds).

Under a drained weight system, assuming exact measurements, the package would show a net weight of 2.88 pounds and a price per pound of \$1.25. The cost of the package would remain \$3.60. The ERS study used this example to illustrate that changing net weight methodology, by itself, only changes the information a consumer receives but not the real cost of the product.

After analyzing the "water in chicken" issue, the 1979 ERS study concluded:

Whether consumers pay chicken prices for water is not clear simply because a dry tare labeling weight is allowed. If \$3.60 is the competitive cost for a package of chicken breasts of that quality, then the consumer is not paying \$1.20/lb. for 0.12 lb. of water and juices. The consumer is simply not being informed that the true price of chicken at the retail level on a drained weight basis is \$1.25/lb. not \$1.20.

Consumers may well be paying more for chicken or other meat and poultry products than can be justified. But to verify such an assertion would require an extensive study of the industrial organization of the industry and data on firm costs, revenues, and profits. Answering that question is beyond the scope of this study.

The economic issue raised by the retained water issue is whether labels reflecting the price of poultry on a "green weight" basis would have enough of an effect on the demand for poultry that consumers would purchase less poultry and more product that competes with poultry. This analysis, like the earlier ERS study, has not attempted to predict the shifts in supply and demand that might occur if product labels included the "true" price of poultry. The marketplace issues are more complex than just pounds and cents. Discussions with retail industry personnel indicate that they believe many consumers object to free liquid in packages and that "dry" looking packages would have a positive impact on demand. They also noted that labeling of water is not necessarily detraction. They point to the rapidly growing market for Individually Quick Frozen (IQF) Ice-Glazed poultry. This product sometimes includes labeling indicating the addition of basting solutions to

enhance flavor and juiciness. IQF Ice-Glazed and marinated products are marketed as convenience products.

VII. Regulatory Options

FSIS identified six options for regulating retained water in raw meat and poultry products. These six options are:

- No limits on retained water as long as the product label indicated the amount of retained water.
- A standard requiring zero retained water for all raw, single-ingredient products.
- A requirement that there could be no retained water in the stated weight of the product.
- A standard that would set limits for retained water based on best available technology within traditional production practices. This option would also require that retained water be identified on product labels.
- A standard that would set limits for retained water based on optimum use of existing equipment. This option would also require that retained water be identified on product labels.

- A standard that would require an establishment to demonstrate that any retained water is an inevitable consequence of the process used to meet applicable food safety requirements. This option would also require that retained water be identified on product labels.

Analysis of Options

This section provides an assessment of the six regulatory options identified. The six options fit into three categories. The first category is represented by Option 1 and can be characterized as the option where there would be no limits on retained water for any raw product as long as the label indicated the presence of that water. The second category covers options where no retained water would be allowed. This analysis discusses two variations, one (Option 2) where no retained water would be allowed in the product and another (Option 3) where no retained water could be included in the product weight. Options 4, 5, and 6 are all similar in that they would permit limited water retention and they would require that any retained water be identified on product labels. These last three options differ in the basis for establishing the limits for water retention. The three options consider limits based on best available technology, limits based on best performance with

existing equipment, and limits based on the retained water necessary to meet existing food safety requirements. Setting new limits based on any of these three criteria would have to meet the Court's requirement that the rulemaking record explain how particular water retention levels are set.

All six options provide consumers with improved information on the price of poultry. Improved information results from either labeling the level of retained water, eliminating all retained water, or a combination of labeling and limiting the amount of retained water. The section on market failure shows that in the meat and poultry industry the information about retained water in raw products available to consumers is inadequate and that, moreover, information available to poultry processors on this matter is not available to consumers.

Provision of labels showing the percentage of retained water would enable consumers make their purchasing decisions with respect of both prices and the quantity of retained water levels and thus reduce, if not eliminate, market failure. The asymmetric information that persists in this failed market would be bridged by the availability of information on the labels.

Improved information provides a consumer benefit in that it allows consumers to make more informed purchasing decisions. The analysis that follows does not quantify the consumer benefits of each option. FSIS recognizes that removing all retained water informs consumers of the "true" price of poultry; no further calculation balancing water content and label price would be necessary. A combination of labeling with a limit on retained water may have greater consumer benefits than labeling alone because the labeled product price would provide improved information to those consumers that would not use the retained water information.

Option 1 - Labeling of Percentage Retained Water

Under this option, there would be no limit on retained water as long as the amount, i.e., percentage of product weight, was indicated on the product label. The same requirement would apply to both meat and poultry products. To assure prominent notification, the product name on the labeling of an affected product would be accompanied by a statement, such as "may contain up to ____ percent retained water" or "contains ____ percent retained water."

After identifying this option, the department concluded that this regulatory option would not be consistent with the existing adulteration provisions

discussed earlier. In other words, unlimited retained water would constitute economic adulteration, even if identified through labeling. While this conclusion eliminates this option, this analysis uses the option as a vehicle to discuss the costs and benefits of using labels to inform consumers about retained water.

The cost analysis presented later in Section VIII concludes that all poultry labels could be revised at a cost of \$18.4 million. This cost would be an up-front, nonrecurring cost. The label revision costs of \$18.4 million are an estimate for the cost of revising labels for raw poultry shipped from federally inspected poultry establishments that both slaughter and further process raw poultry. The estimate of \$18.4 million does not include potential label revision costs for product that is produced in one of the slaughter/processing establishments and then further processed in a second inspected establishment that does not slaughter poultry. To illustrate, there are inspected establishments that purchase whole birds and further process these carcasses into parts of carcasses and other establishments that purchase parts of carcasses and further process these parts. The inspected establishments purchasing product that has "percentage retained water labeling" would have to label their further processed,

single-ingredient, raw products unless they had data showing that the further processing they conduct removes all the retained water. Presumably, the percentage of retained water would decrease during further processing. The further processing establishments would have to label their products to indicate the presence of any remaining retained water. FSIS does not have information on the number of establishments or labels that could potentially be affected.

There are two other situations where revised labels could be required. While most raw poultry sold in retail stores is packaged and labeled in federally inspected establishments, some raw product is repackaged and labeled at the retail level. Retail stores would have to label their single-ingredient, raw products unless they had data showing that the processing and repackaging they conduct removes all retained water. Thus, there would be some cost for labeling retained water at the retail level. Finally, there may also be a few meat labels that need to be revised since some byproducts and organ meats are now washed in water before being shipped.

There would also be the cost of establishing the level of retained water. As discussed earlier, FSIS now employs from 25 to 50 staff years measuring retained water.

Inspected establishments could utilize FSIS test results or conduct their own retained water tests. If such tests are conducted by Quality Control (QC) technicians making \$35,000 annually, the cost of 25 to 50 staff years represents from \$875,000 to \$1.75 million, annually. This option would not require any reduction in the current levels of retained water. Thus, there would be no costs for modifying production practices. The cost analysis in Section VIII addresses the cost of establishing a minimum, which is a different task than establishing the level.

The extent of the labeling benefit, i.e., the value of labeling information to consumers, is affected by several factors. These include the type of label that will eventually be required, the number of different labels present in the marketplace and the variation in retained water within a specific production lot. The first factor affecting the value of the labeling information is the type of label statement. If the label statement indicates "up to _____ percent retained water," the consumer cannot use the information to calculate a true price per pound because the label would not specify the actual amount of retained water. The "up to _____ percent" type of label would provide consumers with general information indicating that some level of added water was present. This type of label

does not provide the same incentive to minimize added water as a label indicating a specific percentage, i.e., "contains _____ percent added water."

The second factor affecting the value of labeling is the number of different labels present in the marketplace. If different establishments have different labels for different levels of retained water, consumers could be faced with a multitude of different labels making price comparisons very difficult. It is not unusual for a large supermarket to stock raw poultry from more than 10 different federally inspected establishments. While it appears reasonable to assume that a company or an establishment would prefer to use a single retained water statement for all raw product labels, it is possible that some establishments would develop alternative labels for each product, each indicating a different level of retained water. Added water content could be established on a day-to-day or production-shift basis.

A third factor affecting the value of labeling is the variation in retained water within a specific production lot. Natural variation is a component of all food attribute labeling. Variation does appear, however to present a greater than usual concern with retained water. Based on the 10-bird tests conducted by FSIS, the package-

to-package variation could be relatively high for whole birds. In a randomly selected 10-bird test for whole broilers (average "green weight", i.e., carcass weight prior to any water absorption, was 3.6 pounds), the average retained water was 6.57 percent. The range was from less than 1.0- percent (0.95) to 14.6 percent. Only five birds were within ± 2.0 percent of the average 6.57 percent. Two individual birds exceeded the 8.0 percent limit. In a second 10-bird test of 3.2-pound broilers averaging 6.92 percent retained water, 6 of 10 were within ± 2.0 percent. Three individual birds exceeded the 8.0 percent limit. This data raises an issue concerning how a percentage labeling option would be implemented, i.e., what level would be required to appear on product labels? Would it be the average or would it be a level that included 90 or 95 percent of the individual birds?

The amount of retained water appears to vary less for turkeys. In one randomly selected 10-bird test of smaller turkeys (regulatory limit of 6.0 percent), 9 of 10 were within ± 1.0 percent of an average retained water level of 5.45 percent. In a 10-bird test of larger birds (regulatory limit 5.3 percent), 7 of 10 were within ± 1.0 percent. One bird exceeded the regulatory limit.

Option 2 - Zero Retained Water

The Agency could establish a standard of zero retained water for all raw, single-ingredient meat and poultry products. In theory, given sufficient drip time or drain time or drying time, all raw, single-ingredient products can be returned to a "green weight." However, available data suggests that returning immersion-chilled poultry to "green weight" may not be feasible. The 1979 ERS study included data that supports the conclusion that water retained during washing and chilling does not completely drain from poultry by the time the product reaches the consumer. For the study, ERS, in conjunction with ten local weights and measures agencies, measured the percent drain in 297 retail packages of chicken from five poultry processors. All packages were whole cut-up chicken packed at establishments using immersion chilling. All brands had an average water pickup of 5 to 6 percent at the time of packaging. For the 297 packages the average drain as a percentage of labeled net weight was 3.42 percent. Assuming the product started at an average of 5.5 percent, the product was still retaining approximately 2.0 percent absorbed water when sampled at retail. The study did not indicate how many days the product had been in distribution. One processor was shipping to retail stores

on both the East and West Coast. Thus, in some cases, there was considerable transportation time involved.

There was a second study³ that showed that the water loss that occurs in the plant from the time the poultry is placed in the package to the time it leaves the plant is substantially less than total retained water. During the development of the 1989 Net Weight Final rule (54 FR 9370, March 6, 1989), FSIS, in cooperation with the National Broiler Council and the National Conference on Weights and Measures, conducted a study on water loss. Data collected from ten chicken processors showed that the average water loss occurring in the plant after packaging was 1.8 percent. The study did not, however, include data on the length of time the product stayed in the plant after initial packing.

FSIS technical personnel believe that a zero standard would require the poultry industry to abandon immersion chilling because attaining zero-retained water with immersion chilling is not technically feasible. Installing air chilling or air chilling/spray systems would require major reconstruction costs for the poultry industry. There is also a potential cost associated with possible increases in pathogen levels. Studies have shown that immersion

chilling reduces overall pathogen levels on poultry. If this option would force the poultry industry to abandon immersion chilling and pathogen levels increased, then there could be additional social costs associated with increases in foodborne illness. With this option there would be no need to revise product labels.

Under this option, consumers would benefit by being fully informed as to the price of both meat and poultry products. No balancing of water content and label price would be necessary. However, because the benefits of better informed consumers from a zero-retained water standard are unlikely to surpass the costs, this option was eliminated.

Option 3 - "Green Weight" Labeling

A variation on the concept of zero-retained water is the option where there could be no retained water in the stated weight of the product. Establishments would be required to establish a retained water level for each "lot" or shift. Scales would then have to be adjusted to account for retained water. The weight indicated on product labels would be an estimate of the "green weight" prior to the final carcass wash.

³ U.S. Department of Commerce, National Institute of Standards and Technology (NIST), Report of the 73rd National Conference on Weights and Measures, NIST Special Publication 750, 1988.

The only direct cost is the cost of establishing the amount of retained water in order to adjust scales. There would be no need to revise product labels or modify chilling practices. The major impact would be a reduction in the labeled volume of poultry production by an estimated 1.5 billion pounds. Concomitant with this decrease in production of poultry, there would be an increase in wholesale prices associated with an upward shift in the supply function for poultry. The increase in price and a decrease in production would tend to reduce consumers' surplus or welfare. The extent of loss in consumer welfare would depend on elasticity of demand for poultry -- the more inelastic the demand, the smaller would be the welfare loss to consumers.

A disadvantage of this option would be that the labeled weight would only be an estimate of the "green weight." The package-to-package variation would now be an issue for the accuracy of the net weight statement rather than the accuracy of a qualifying statement. There could also be considerable differences between labeled weight and packaged weight. This option would require the Agency to revise the overall system for regulating net weight accuracy.

If this option were selected, FSIS would have to reopen the net weight regulations. In 1990, after four final rules and almost two decades, FSIS published final rules for net weight labeling of meat and poultry products (55 FR 49826, November 30, 1990). In the final net weight rule, FSIS established a regulatory framework that for all compliance testing in federally inspected establishments; the net weight of raw chicken would be established using a dry tare system. In a dry tare system, both free liquid and liquid absorbed by packaging material would be included in the net weight of the product. At the same time, the rule recognized that a few State and local weights and measures authorities still prefer to conduct wet-tare compliance testing. Under a wet-tare system, the free liquid and liquid absorbed by packaging material are not counted in measuring the product weight. The final rule established a 3-percent "gray area" where, if fresh poultry minus any liquids (free liquid plus liquid absorbed by any packaging material) is within 3 percent of the labeled weight, further information is sought before any determination is made. The 3-percent "gray area" applies only in localities using wet-tare testing. The task force that recommended the 3-percent gray area for raw poultry

noted⁴ that the recommended level would require over pack by manufacturers supplying wet-tare localities to compensate for water lost.

Enforcement of net weight requirements is an area where Federal, State, and local authorities share responsibility and must cooperate. The enforcement procedures, as adopted by the National Conference on Weights and Measures, are published in NIST Handbook 133, Third Edition, Supplement, "Checking the Net Contents of Packaged Goods." FSIS' net weight regulations incorporate Handbook 133 by reference. The National Institute of Standards and Technology (NIST) has a statutory responsibility for "cooperation with the States in securing uniformity of weights and measures laws and methods of inspection." At the same time, the FMIA and PPIA do not allow State and local jurisdictions to impose any standards that differ from those published by FSIS. In publishing the final net weight regulations in 1990, FSIS stated that the "rule is designed to enhance the ability of Federal, State, and local agencies to enhance the industry-wide use of strict net weight standards at the packing, warehouse and retail level." Although this option would enable FSIS

⁴ U.S. Department of Commerce, National Institute of Standards and Technology (NIST), Report of the 73rd National Conference on Weights and Measures, NIST Special Publication 750, 1988.

to address economic adulteration, it was eliminated because of complexity associated with its enforcement, e.g., involvement of the National Institutes of Standards and Technology, State and the local governments, and because of the need to maintain uniformity in weights and measures laws and methods of inspection.

Option 4 - Retained Water Limits Based on Best Available Technology Within Traditional Production Practices

Under this option, FSIS would require all establishments to meet water limits based on the lowest levels that are currently being achieved by those establishments using the best available water-immersion chilling technology. The limit for retained water in carcass beef, pork, lamb, and goat would remain at zero. There might be some costs associated with establishing limits for the byproducts and organ meats that are now processed separately from carcasses.

FSIS recognizes that, for the poultry industry, the concept of a "minimum" cannot be separated from some definition of standard manufacturing practices that would include a reasonable drip or drain time and some reasonable minimum temperature for chiller water. Longer drip lines and lower chiller water temperatures are both factors that would increase the cost of chilling poultry.

Under this option, it is envisioned that the new limits would be established based on data from the establishments using the best technology. There would be costs for collecting and analyzing the data and costs from modifying processes to reduce water retention. This option could impose considerable costs on those establishments that do not currently have the best available technology.

The maximum allowed water level could actually be a series of levels for different types and weights of meat and poultry products. Under this option, products could not contain more than the established limits and all products containing retained water would have to be labeled to indicate the presence of retained water. The costs of labeling the percentage retained water would be similar to those described under Option 1. The factors affecting the value of labeling information would still exist, but there should be fewer different labels because the range of permissible retained water levels would be reduced.

Operating the best technology so as to minimize retained water may not be consistent with minimizing pathogens. Thus, there is a potential cost associated with increased pathogen levels and increased foodborne illness.

This option would enable FSIS to effectively address economic adulteration and would provide consumers

information. However, because the costs to industry to acquire the best available technology would be large and because this option would take FSIS back to the era of command and control instead of incentive-based performance standards, this option was eliminated. Furthermore, the option would have the effect of a design standard.

Option 5 - Water Limits Based on Existing Equipment

This option would require all establishments to operate their existing equipment so as to minimize retained water. As discussed in the previous option, minimums would have to be based on some reasonable limits for operating parameters. The retained water requirement for carcass meat would remain at zero since meat establishments are already operating at zero.

As with the previous option, new retained water limits are required for this option. Data would have to be collected and analyzed to establish minimum water levels for different types of equipment. There would be costs for collecting and analyzing this data. However, no establishment would have to replace equipment, as all minimums would be based on existing equipment. This option would presumably lead to a larger number of retained water requirements. FSIS technical staffs believe retained water is related to variables such as type of chiller, water

temperature, time in chiller and type and level of agitation.

Retained water would have to be identified on product labels. The factors affecting the value of labeling would still exist. Having different minimums for different equipment would probably lead to a greater number of labeling variations.

Minimizing retained water may not be consistent with processes that minimize pathogens. Thus, there is a potential cost associated with increased pathogen levels.

Option 5 is superior to Option 4 in that no establishment would have to replace existing equipment or processes. This factor outweighs the potentially higher cost of establishing limits and the potential decrease in the value of labeling information due to a greater number of labeling variations

Option 6 - Retained Water Limits Established by Processes
Necessary to Meet Food Safety Requirements

Under this option, all establishments would be expected to meet a zero-retained water standard (i.e., Option 2) unless data demonstrate that another level is necessary to meet existing food safety standards using existing washing, chilling, and draining systems (i.e., by introducing food safety objectives to Options 4 and 5).

FSIS envisioned that such data could be established on an industry-wide basis, for a specific industry sector using similar processes, or on an establishment-by-establishment basis. The data could be collected and analyzed by individual establishments or by trade associations or other groups.

There would be costs for collecting and analyzing data. For the previous option, the data would be collected to establish a minimum. For this option, the data would be collected to establish a minimum while still meeting the existing chilling requirements. Thus, the poultry industry costs for establishing the limits should be essentially the same as the costs for the previous option. The meat industry would establish limits for retained water only if they viewed it as a new lower cost option for meeting pathogen reduction performance standards. Any retained water would have to be identified on product labels. The limits on retained water would, most likely, be a series of levels for different types and weights of meat and poultry products. The value or usefulness of the labeling will depend on the number of different limits and whether those limits are established on an industry-wide basis or on an establishment-by-establishment basis.

The actual retained water limits for this option would be based on the inevitable consequence of meeting food safety requirements with existing processes. The necessity of meeting food safety requirements would lead to equal or higher retained water levels than those based on best available technology (Option 4) or best use of existing equipment (Option 5). FSIS selected this option for the final rule.

VIII. Market Impact -- Analysis of Price Elasticities

The potential economic impact of this rule on the poultry industry in general and on small producers in particular is likely to be minimal because this industry is so highly competitive that no single processor could raise prices on its products without losing market share. For example, Thurman (1987) noted that poultry price behaves as if the poultry market had a perfectly elastic supply function. In other words, market supply of poultry can be increased without significantly decreasing its price.

Moreover, the U.S. demand for poultry and poultry products is relatively inelastic, i.e., insensitive to price. Price elasticity of demand is the percent change in demand associated with a one-percent change in price. A review of 11 economic studies of the demand for poultry shows that the elasticity ranges from (-0.1) to (-0.94).

In other words, an increase in price of poultry by 1 percent would be associated with a decrease in demand of 0.1 to 0.94 percent (see Table 3). Table 3 also shows that the estimated elasticities vary with time periods for which the data were analyzed and the types of models employed by the analysts. Since the estimated elasticities are pure numbers, (based on Table 3), FSIS calculated an average elasticity at (-0.46). Therefore, an average increase in price of poultry by 1% would be associated with a decrease in demand of poultry by about 0.5% only.

Assuming that the costs of compliance with this rule bring about an upward shift in the industry supply curve, there would be an increase in price because the new supply curve would intersect the existing demand curve at a higher level. The extent of the decrease in demand would, however, depend on the elasticity of demand for poultry. Since the price elasticity of demand for poultry is 0.5, a one-percent increase in price would result in a decrease in demand by about one-half percent. This decrease in demand would also be associated with a decrease in consumers' surplus or welfare because of the nonavailability of the required supply of poultry. The decrease in supply of poultry would be accompanied by a decrease in employment and earnings.

Table 3. Price Elasticity of Demand for Poultry - A
Summary Review of Economic Studies

Study No.	Author(s)	Price Elasticity	Time Period	Model
1	Alston & Chalfant (1993)	-0.94	1967-1988 Quarterly	Rotterdam
2	Brester & Wohlgenant (1991)	-0.296	1962-1989 Annual	Inter-related demand
3	Capps et al. (1994)	-0.893	Jan.1986 to June 1987 Weekly	Retail Demand Functions
4	Eales, J.(1994)	-0.63	1966-1992 Quarterly	Inverse Lewbel Demand
5	Eales & Unnevehr (1993)	-0.233	1966-1988 Quarterly	Simultaneity & Structural Change
6	Gao & Shankwiler	-0.47	1956-1987 Annual	Taste Change

	(1993)			
7	Hahn, W. (1994)	-0.299	1981-1992 Monthly	Random Coefficient
8	Hahn, W. (1988)	-0.14	1960-1984 Annual	Income Differences
9	Moschini & Meilke (1989)	-0.10	1967-1987 Quarterly	Structural Change
10	Thurman (1987)	-0.64	1955-1981 Annual	Demand Stability
11	Wohlgenant (1989)	-0.42	1956-1983 annual	Complete System

The conceptual framework for analyzing the effect of higher poultry prices on increased demand for livestock meat assumes that poultry products are perfect substitutes for meat products. In practice, the substitutability of these products is likely to be limited because of their price differentials and the tastes and preferences of consumers. For example, prices of poultry products are considerably lower than prices of livestock products. Also, consumers might prefer to buy poultry even at higher prices because of their tastes for poultry as well as

concerns of some consumers that livestock products contain excessive cholesterol and fat.

To determine the substitutability of these products, economists estimate cross elasticity or sensitivity of demand for livestock meat products associated with a change in price of poultry. Conceptually, economists expect that the cross elasticity of demand for livestock products associated with an increase in price of poultry would be positive. FSIS reviewed the literature on cross elasticity and found that the results of empirical estimation of the cross elasticity are inconclusive. Table 4 shows that the cross elasticity ranged from (-0.64) to (0.07). This table also shows that almost all of the cross-elasticity estimates are negative. Based on these estimates, FSIS concludes that any increase in prices of poultry is unlikely to result in an increase in demand for livestock products.

Table 4. Cross Price Elasticity of Demand for
Livestock Meat with respect to Price of Poultry - A Summary
Review of Economic Studies

Study No.	Author(s)	Price Elasticity	Time Period	Model
1	Alston & Chalfant (1993)	-0.03	1967-1988 Quarterly	Rotterdam
2	Brester & Wohlgenant (1991)	-0.04	1962-1989 Annual	Inter- related demand
3	Choi & Sosin (1990)	-0.013	Annual 1953-84	Translog Demand Function
4	Eales, J.(1994)	-0.75	1966-1992 Quarterly	Inverse Lewbel Demand
5	Eales & Unnevehr (1993)	0.07	1962-89 Annual	Theoretical ly Consistent Demand

6	Gao & Shankwiler (1993)	-0.10	1956-1987 Annual	Taste Change
7	Hahn, W. (1994)	-0.117	1981-1992 Monthly	Random Coefficient
8	Hahn, W. (1988)	-0.05	1960-1984 Annual	Income Differences
9	Moschini & Meilke (1989)	-0.13	1967-1987 Quarterly	Structural Change
10	Moschini, Moro & Green (1993)	0.10	1947-78 annual	Rotterdam
11	Wohlgenant (1989)	0.02	1956-1983 annual	Complete System of Demand Functions

IX. Effect on Product Quality

FSIS is aware that a substantial change in retained water could have an effect on product quality and performance. Certainly, consumers have become accustomed to purchasing fresh poultry that is very moist and presumably could have a lot less retained water and still have a moist surface. FSIS is not aware of any studies concerning the effect of water retention levels on cooking properties, flavor, shelf life, or visual attributes of U.S. poultry products. Discussions with officials in the retail industry indicate that they frequently hear consumer complaints concerning excess water in packages. Since most livestock products do not currently have retained water, FSIS assumes that the livestock products industry will not conduct marketing studies that would demonstrate the viability of product with added water before any production practices were changed.

X. Costs and Benefits of the Final Rule:

Estimation of Costs

The purpose of this section is to estimate the costs of the final rule. The final rule creates three types of costs: (1) the costs for establishing water levels necessary to meet food safety requirements, (2) the costs associated with reducing retained water to such levels, and

(3) the costs of revising product labels to indicate the presence of retained water. In the following analysis, FSIS combines these cost elements, which are all denominated in dollars, to determine the impact of the final rule on the industry. Most of the potential cost impact falls on poultry establishments using water-immersion chiller systems. There are approximately 300 federally inspected and an estimated 65 State-inspected poultry slaughter establishments. There will also be some impact on livestock slaughter establishments and on retail stores that re-pack and re-label raw, single ingredient meat and poultry products.

In the long run, costs will tend to decrease as the industry responds to competitive pressures to lower retained water and adopts newer, less costly, technologies as the current chilling plants and equipment are depreciated. These reductions in retained water and the associated benefits to consumers would tend to increase net incremental economic benefits to consumers.

Cost of Establishing Water Limits

The final rule prohibits retained water in raw meat and poultry products unless the water is an inevitable consequence of the process or processes used to meet applicable food safety requirements. To establish a non-

zero retained water limit, an inspected establishment or trade association or other group would have to generate supporting data. The final rule will allow such data generating studies to be conducted for an individual establishment or for an industry sector using the same or similar processing techniques and equipment.

Meat Industry

This requirement is unlikely to have a significant impact on the meat industry because, except for that portion of the industry producing byproducts, the meat industry is already achieving zero retained water. This final rule will, however, provide an alternative for establishments that are having or will have trouble meeting the Salmonella performance standards. These establishments could utilize a full range of approved antimicrobial rinses or hot water rinses without having to worry about achieving zero retained water. If establishments can demonstrate that they need a non-zero limit to meet the Salmonella standards, they can utilize the flexibility provided by this rule and establish a new retained water limit as long as they indicate the presence of retained water on product labels.

It is assumed that 500 meat establishments (10% of the 5,000 affected meat establishments) would conclude that

they cannot meet the new pathogen reduction standards without using a process that results in some level of retained water. The 10% estimate is from the Final RIA published with the final PR/HACCP rule (61 FR 38976-38977; July 25, 1996). In that analysis, FSIS referred to historical data showing control problems in from 5 to 10 percent of inspected establishments. The estimated 500 establishments having difficulty meeting pathogen reduction standards would be required to conduct tests to establish unavoidable water-retention levels and possibly some additional Salmonella tests. The analysis assumes 200 hours per establishment for water tests and 100 hours to collect a sample set for Salmonella. The total cost would be 150,000 hours or \$3.75 million for labor and another \$1.2 million for 35,000 sample analyses. These estimates are based on cost factors from the FRIA for the PR/HACCP rule, i.e., \$25 an hour for a quality control manager and \$34 for a laboratory analysis for Salmonella. The average sample set for meat is approximately 70 samples, considering 82 for steer or heifer carcasses and 55 for swine carcasses. The total cost for the meat establishments would be an estimated \$5 million. The costs for Salmonella testing and the costs of using alternative processes such as carcass washing systems have already been

addressed in the FRIA for the PR/HACCP rule in the discussion of compliance costs for meeting the Salmonella standards (Federal Register reference noted above). The cost of establishing water limits (100,000 hours or \$2.5 million) would be additional costs. In return, this rule provides an alternative that doesn't currently exist.

Poultry

FSIS does not consider air chilling to be an economically feasible alternative for chilling poultry. Thus, it seems reasonable to assume that the poultry industry would conclude that immersion chilling is necessary to meet the former chilling requirements for poultry, e.g., 9 CFR 381.66(b)(2) requires that poultry carcasses under 4 pounds to be chilled to 40° F. within 4 hours following evisceration. It follows that the retained water necessary to meet food safety requirements is the minimum level that can be reached with existing equipment and still be in compliance with the chilling requirements. There is also the possibility that the retained water necessary to meet the pathogen reduction performance standards for Salmonella is higher than the level necessary to meet chilling requirements. The following discussion, however, assumes that the unavoidable retained water levels are driven by the chilling requirements.

The Agency believes that the industry already has considerable information on the chiller variable settings that minimize water retention. The variables of concern are chiller water temperature, water intake, total time in chiller and level of agitation. FSIS, therefore, believes the poultry industry can establish water limits for various chiller systems with minimal costs. Under current regulations (9 CFR 381.66(d)), establishments must conduct a 50-bird test to demonstrate that any change in chilling procedures does not affect compliance with existing requirements. This analysis assumes that poultry establishments could establish minimum retained water levels by conducting four 10-bird tests at ten different chiller settings for each product category. It is assumed that the average establishments would have two product categories, e.g., light hens versus heavy toms. Each test would take an estimated 2.5 hours to select birds, tag and weigh birds, and reweigh birds after chilling. (The FSIS 10-bird test takes from 40 to 60 minutes.) Time required between tests would not be considered a cost. Thus, testing would cost each plant 200 hours or \$5,000 using a quality control manager making \$25 per hour. The cost to 300 inspected establishments would be 60,000 hours or \$1.5 million. Some smaller federally inspected establishments

and presumably more State-inspected establishments do not use immersion chilling. They chill using ice and slush on processing tables/counters and have retained water levels below 2 percent. In the data collected from the field, two chicken establishments with annual production under 200,000 birds had retained water levels of 1.58% and 1.7%. It is assumed these smaller establishments are at a minimum level and would incur no additional cost to establish a minimum. These establishments do not appear to have any variables that could be studied during a water test.

The final rule doesn't provide specific guidance on options available for poultry processors that are already operating far below the existing standards for Salmonella. For example, a young chicken slaughtering establishment that has an unavoidable retained water level of 5 percent (due to immersion chilling for time/temperature) and is consistently achieving Salmonella positive levels of around 10 percent -- well below the existing standard of 20 percent -- may be able to operate at a higher retained water level if data show that the establishment could then achieve an even lower level of Salmonella. Under the final rule, if FSIS lowers the pathogen reduction standards as stated in the preamble to the PR/HACCP rule, inspected establishments will have the option of increasing retained

water if appropriate tests show that such increases are unavoidable in meeting revised food safety standards.

In this context, it may be recalled that one of the commenters had noted that increasing water retention in achieving non-required Salmonella levels (i.e., reducing Salmonella levels below the pathogen reduction performance standards) would defeat the purpose and goal of the rule. FSIS responded that the Agency's policy is to prioritize food safety gains over other consumer protection (OCP) considerations in situations where it is necessary to do so. It should be noted that zero water retention is an OCP measure. FSIS will encourage establishment efforts to improve the safety of their products. FSIS does not think that this rule will lead to increased water retention in products unless the increase is a result of processing that improves food safety. In short, FSIS will not permit plants to lower retained water to the extent that pathogens increase beyond the performance standards for the pathogens because food safety takes priority over OCP measures.

Costs of Reducing Retained Water

If establishments are able to demonstrate that current levels of retained water are necessary to meet food safety standards, establishments would not incur costs for reducing retained water. However, to the extent that

establishments cannot demonstrate that current retained water levels are necessary for meeting applicable food safety standards, significant costs may be incurred as establishments modify processes to minimize retained water levels. Reducing retained water could entail a wide range of processing modifications, depending on the type of chilling equipment currently used and amount of retained water that would have to be removed.

The Economic Research Service (ERS) conducted some preliminary analyses to begin to establish estimates of what it might cost to significantly reduce the amount of retained water in raw poultry. There are three ways to reduce retained water. The first involves holding poultry in refrigerated rooms until excess water has drained off the birds. The second involves making adjustments in the chilling process to reduce water absorption. The third involves a change in the chilling system, i.e., a move to air chilling or air chilling in combination with a water spray. As noted elsewhere in this PRIA, FSIS does not consider requirements that would mandate air chilling to be economically feasible. The existing regulations for air chilling (9 CFR 381.66(e)) require the internal temperature of the carcass to be reduced to 40 °F or less within 16 hours. There are limited data on costs of air chilling.

Both reconstruction costs and operating costs would be high. The 1979 ERS study included an estimate from an industry source that air chilling uses more energy and costs about 4 cents per pound more than immersion chilling. The ERS study noted that there was only one major U.S. poultry processor using air chilling in 1979. A draft Impact Analysis Statement conducted for the 1978 final rule to reduce water use requirements for chilling stated that retail prices for air chilled birds were running approximately 20 percent higher than water chilled birds. That analysis attributed the higher retail prices to the higher capital cost and higher operating expenses.

The simplest way of viewing the cost of reducing retained water is to consider the incremental operating costs under the conditions, e.g., chiller temperature, that established the minimum unavoidable water. Such conditions could also involve optimizing water temperature and flow through the chillers, reducing the amount of agitation of the chilling medium, and reducing the "dwell time" of poultry in the chillers. If, as some believe, lower water temperature reduces water absorption, the response to tighter retained water requirements will be the installation of new or heavier compressors to lower the temperature in the chiller units. An installed additional

compressor would cost an estimated \$150,000 per establishment, or an estimated \$45 million for all 300 federally inspected establishments.

FSIS does not have a method for estimating a cost for operating at conditions that establish a non-zero level of retained water necessary to meet food safety requirements. As an alternative, this PRIA estimates the cost of removing a substantial portion of the existing water using an extended draining or dripping process. One can view the estimated draining costs as an upper bound on the cost of removing water. An establishment would only use draining under conditions where the cost of draining was less than the incremental operating costs.

To extend draining or dripping time, many establishments may have to add refrigerated facilities, purchase vats for storing birds being drained, hire additional personnel, and purchase additional stock handling equipment. There may be inventory costs due to holding birds off the market for a longer time before shipment. Holding birds at inspected establishments also is likely to reduce the corresponding retail shelf life.

The ERS staff developed some cost estimates for holding poultry based on the following industry input:

- One common method of draining uses stainless steel vats at a cost of \$1,000 each.
- Vats hold approximately 500 chickens or 100 turkeys.
- Cooler space costs \$125 per square foot.
- Vats can be stacked two high.
- Stacked vats with aisles require 12 square feet of space per vat.
- Forklifts to move vats cost \$24,000 each.

With the above factors in mind, one can address the questions of: "What are the fixed costs of draining a substantial amount of absorbed water from poultry?"

The Daily Moisture Records sometimes include a record of the additional drain time required. The time varies considerably probably depending on the initial water level, the drain configuration, and the location of the excess water, i.e., under skin versus between muscle tissue or within muscle tissue. The available data, for cases where young chickens were more than 1 percent over the limit, indicates that it can take from $\frac{1}{2}$ to $3\frac{1}{2}$ hours to drain one percent. In two cases where broilers exceeded the 12 percent regulatory limit by more than 4 percent, the required drain time was approximately 12 hours. Program personnel estimate that the drain time per percent

increases as the birds approach "green weight," i.e., it takes longer to drain from 8 to 4 percent than it does from 12 to 8 percent. Thus, it seems reasonable to conclude that a 12-hour drain would be the minimum time required to remove most of the retained water from chickens.

Most of the drain times for turkeys ranged from $\frac{1}{2}$ to 1 hour on an "hour per percentage reduction" basis. However, two cases showed drain times in the 10 to 11 hours per percentage reduction range. All of the turkey violations noted were less than 1 percent above the existing limit whereas some of the chickens started at water levels 4 to 5 percentage points above existing limits.

The existing data from water control efforts indicates that it could take at least 12 hours to remove a substantial portion of the retained water in chickens. The 12-hour estimate is based on starting at a relatively high percentage and lowering the level by 4 to 5 percentage points. Thus, a 12-hour drain would reduce the existing level from 5 to 6.5 percent by an amount of less than 4 to 5 percentage points. To drain chickens for 12 hours is somewhat equivalent to saying the industry would need to add the extra capacity to drain half a day's production, since most chicken is processed in establishments running two shifts.

Since average chicken production is 29.5 million birds per day (assuming a 260-day work year), half a day's production is 14.75 million birds. Using the above factors, this would require 29,510 vats at \$29.5 million; 354,120 square feet of cooler space at \$44.3 million; and \$4.8 million of forklifts assuming the largest 200 chicken establishments would each require an additional forklift. In this 12-hour case, the total fixed costs would be \$78.6 million.

Similarly, half a day's production for turkeys is 557,000 birds requiring 5,570 vats at a cost of \$5.57 million and cooler space at a cost of \$8.36 million. Assuming that the largest 70 turkey establishments would require an additional forklift at a total cost of \$1.68 million, the total fixed costs for draining all turkeys for 12 hours would be \$15.6 million. Thus, total fixed costs for a 12-hour drain for chickens and turkeys are estimated at \$94.3 million.

One can argue that large plants already have the capacity to store a shift's production. This occurs today when limits are exceeded. The Meat and Poultry Inspection Manual provides, as an alternative to calculated drain time, a 24-hour continuous drain at 40° F. or below before shipping. The data reviewed for this analysis included two

such cases. Today's excess capacity can also be viewed as a contingency capacity that would still be required over and above any additional capacity needed to achieve an overall water reduction.

This analysis has not attempted to estimate the complete variable costs of holding poultry to drain. Variable costs would include increased labor costs, increased utility costs, increased overhead, and the cost of carrying additional inventory. Holding half a day's production is equivalent to continually storing a wholesale value of \$37 million in poultry (\$19.2 billion divided by 520 shifts). At a 10 percent interest rate, the annual cost of draining poultry for 12 hours would be \$3.7 million.

It would also seem reasonable to assume a minimum average of one additional employee per establishment. Three hundred employees at \$21,500 per year (average wage in chicken slaughter establishments of \$10.34 per hour) would result in an annual operating cost of \$6.4 million. Thus, FSIS estimates the minimum variable costs at \$10.1 million (\$3.7 million plus \$6.4 million) per year if the response is to drain poultry.

The above analysis has provided an estimate of the cost of reducing retained water by a "substantial" amount,

i.e., an amount that can be equaled to a 12-hour drain. Available data indicates that a 12-hour drain could reduce overall water by an amount somewhat less than 4 to 5 percentage points at an estimated first year cost of \$104.3 million (\$94.2 plus \$10.1 million) and recurring annual costs of at least \$10.1 million.

Cost of Revising Labels

The cost of revising labels is a relatively easy cost to quantify. For previous rulemakings, FSIS has collected survey data on the costs of label revisions. Labeling changes have been the subject of several rulemakings in recent years.

The final rule will entail a one-time change in affected raw meat and poultry product labels to add a statement of the percentage of retained water in the product next to the product name. Establishments may have to prepare or order new product labels to comply with this requirement. FSIS will allow establishments to run out their stocks of existing product labels before the proposed labeling requirements would take effect. The establishments, therefore, will not incur costs of discarding existing label inventories.

The cost of revising a label varies widely depending on the type of label, the number of colors affected, and

the printing process used. Adding a water content statement is the lowest cost type of modification because it involves single color printing and no graphic art. The cost of revising labels is an up-front, nonrecurring cost. This analysis uses an average cost of \$1,000 for each product label that must be modified. The cost can vary widely, however. Discussions with turkey industry personnel indicate that it can cost from \$1,500 to \$2,000 to change a label for one of the opaque plastic bags used to package whole turkeys. In contrast, a 1992 survey conducted in conjunction with nutrition labeling regulations found that many small firms use simplified labels that can be revised for less than \$200 per label.

Labeling Costs to Poultry Industry

The primary impact will be on the approximately 300 federally inspected and 65 State inspected establishments that slaughter and pack raw poultry. Currently, 135 of the federally inspected establishments are considered large entities, according to Small Business Administration (SBA) criteria (establishments having more than 500 employees). The cost to these "large" establishments of changing labels is estimated at approximately \$12.5 million. There are another 168 federally inspected poultry establishments that slaughter and pack raw poultry. The estimated labeling

cost for these establishments is \$5.9 million. The method for estimating these costs is illustrated in Table 2.

Table 2
Costs of Revising Product labels
For Poultry Establishments

Establishment Category	Number of Establishments	Average Number Of labels	Cost at \$1,000 Per Label (\$000)
Large Chicken	115	100 ^a	\$11,500
Large Turkey	20	50	1,000
Small Poultry	168	35	5,880
TOTAL	303	--	\$18,380

^a Available information indicates large chicken plants have more unique labels, but many are modified by changing a retail chain specific sticker on a base label. A single modification to a base label in effect revises many labels.

Labeling Costs to Meat Industry

The meat industry also may incur some labeling costs. Some edible meat byproducts and organ meats are washed and cleaned before being shipped in commerce and may be chilled or packed in water to preserve their safety and wholesomeness. Tripe, for example, is bleached and scalded before being shipped. Some organ meats, such as chitterlings (swine intestines), are chilled and packed in water. The Agency does not have any data to estimate the

number of establishments or number of labels affected. Similarly, the analysis has not accounted for separate packaging of poultry giblets. Poultry giblets, including livers, hearts, and gizzards (and necks, though strictly speaking, necks are not giblets) are washed and chilled in water before being packaged and shipped.

There also will be some labeling costs to retail stores that repackage raw products. They would have to apply some form of label, most likely a sticker, to store-packaged product that has retained water. Today, most raw poultry sold from retail meat counters is packaged under Federal inspection. Thus, the overall retail impact should be minimal. Many large supermarkets also prepare fried chicken or rotisserie chicken that is marketed through their deli departments. Obviously, if they prepare the product as ready-to-eat product, it would no longer have to be labeled. The same would be true for products that are marinated or otherwise seasoned and marketed as convenience ready-to-cook products.

Expected Benefits of the Final Rule

Because of longstanding industry petitions and the decision in the Kenney case, FSIS has had to develop new regulatory requirements to carry out its responsibilities for protecting the public from economic adulteration.

Prevention of economic adulteration is a consumer benefit. Consumers also will benefit from the additional information on retained water that will be provided as a result of the labeling requirement. The information on retained water should contribute to a sounder basis for purchasing decisions. Consumers are currently not being informed about the amount of retained water. Consumers will benefit from having improved knowledge of product quantity in terms of meat or poultry meat content.

The final rule will provide the meat industry with additional flexibility for meeting the pathogen reduction performance standards. Meat processors will be able to use pathogen reduction techniques without having to be concerned about meeting the existing zero retained water requirement. Of course, if their single-ingredient raw products retain water, the products will have to be labeled to indicate how much water may be retained.

This final rule also will provide affected establishments with increased flexibility to choose the most appropriate means for implementing HACCP plans for protecting the safety of raw product while minimizing the potential for economic adulteration. By removing certain command-and-control requirements and providing increased

flexibility for HACCP implementation, this final rule may reduce the costs of HACCP implementation.

Finally, the rule will also provide all affected establishments with the flexibility and market incentives to implement new procedures for meeting pathogen reduction performance standards. In addition, by replacing command-and-control requirements with HACCP-consistent performance standards, the final rule will eliminate some recordkeeping and reporting burdens, provide for increased flexibility, and reduce the costs of HACCP implementation.

Expected Costs and Net Benefits: In the PRIA, FSIS estimated the fixed costs (nonrecurring) associated with reducing retained water by a substantial amount to be as high as \$95 million (\$120 million in year 2000 dollars) if extensive modifications had to be made in chilling systems and variable (recurring) labor costs to be as high as \$10.1 million (Federal Register September 11, 1998:48979). FSIS estimated the cost of determining retained water limits at \$2.5 million for about 500 meat establishments and \$1.5 million for about 300 poultry establishments, assuming that the poultry establishments already have considerable information relating to the variable settings of their chilling equipment. FSIS estimated the costs of the

required labeling (also nonrecurring) at \$18.4 million (Federal Register September 11, 1998:48967). Another source estimated this cost at \$44 million, if *all* raw, single-ingredient poultry products continue to retain water (USDA/ERS, "Absorbed Moisture in Poultry Products," Staff Paper, 1997). These cost estimates would be lower if retained water is eliminated from some or all of these products. Thus, the total fixed costs of the final rule would range from as low as \$20 million (for labeling plus determining retained water limits) to \$114 million, and to as high as \$140 million. The estimate of \$140 million is based on extreme assumptions.

To sum up, FSIS estimated two scenarios of costs. The first scenario, with high fixed costs but lower operating/labeling costs, estimated the total costs at \$126.8 million (\$94.3 m fixed, \$10.1 variable for chillers, \$4.0 for determining retained water limits, and \$18.4 for labeling). The second scenario, with high fixed and high labeling costs, estimated the total costs at \$148.4 million (\$94.3 fixed, \$10.1 variable for chillers, \$4 million for establishing water limits, and \$40 million for labels).

FSIS believes that the preceding cost estimates would be exceeded by the direct benefits of the rule. These benefits have been identified but could not be quantified.

Direct benefits would be realized by consumers who would use the information on retained water in poultry and meat products to make their purchasing decisions.

A benefit to producers is the added flexibility to utilize pathogen reduction techniques without having to be concerned about meeting the existing zero retained water requirement. Since this rule eliminates the requirement for minimum (1/2 gallon) quantity of water to be used to chill every broiler, poultry producers may benefit by reduction in their costs of water.

FSIS believes that consumers and producers will realize the benefits of this rule on a daily basis. In contrast, most of the costs are one-time fixed costs for upgrading the chillers. These costs would be spread over the life cycles of the upgraded chillers so that their annualized values would be very small.

XI. Regulatory Flexibility Act -- Effect on Small Entities

FSIS has analyzed this rule under the Regulatory Flexibility Act (5 U.S.C. 601-612), as amended, as well as under Executive Order 12866. Only one of 24 *livestock* products included in Standard Industrial Classification (SIC) 2011 is likely to contain retained water. This classification is broadly labeled as "Variety meats, edible

organs made in slaughter plants". Separate data for this product are not available. Analysis of combined data for all 24 products indicates that in 1994 (the latest year for which SIC data are available from U.S. Department of Commerce/Bureau of the Census), this industry had 1,061 firms with 1,200 establishments. According to the applicable definition of "small business" used by the Small Business Administration, 15% of these establishments were large (employment exceeding 500), i.e., 85% of the establishment were small. These "small" establishments employed 40% of the 84,000 workers employed in this industry and accounted for 40% of the industry's payroll and 40% of its total revenues. Since separate data for "Variety meats, edible organs made in slaughter plants" are not available, it is currently difficult to predict the impact of this final rule on this segment of the industry.

The second group of products with retained water is SIC 2015: *Poultry* slaughtering and processing. In 1994, the latest year for which the Census data are available, there were 332 firms with 567 establishments in this industry. This industry was equally divided into small- and large-size establishments: one-half of the establishments had more than 500 employees. The larger businesses had, however, accounted for by far the largest share of employment, payroll and revenues. For example,

the large establishments employed 91% of 208,000 employees, had 91% of annual payroll, and accounted for almost 90% of the industry's revenue. Conversely, the small establishments had only around 10% of employment, payroll, and revenues of the industry even though they comprised of 50% of the total number of establishments in the industry. As noted in the proposed rule, these large establishments are likely to be adversely impacted by the rule because they use continuous immersion chillers (e.g., carcasses weighing 4 lb. or under must be chilled to 40 degrees F or below within four hours after evisceration). In contrast, the small establishments do not use these chillers but instead use ice or slush in tanks or vats to meet the existing chilling requirements so that they do not retain water. As such, these small businesses are unlikely to be adversely affected by the potential cost of compliance with the final rule.

Moreover, data from the U.S. Department of Commerce/Bureau of the Census 1994 Survey of Industries suggest that the poultry slaughtering and processing industry in the U.S., with 332 firms and 567 establishments, is highly competitive. As noted above, in 1994, this industry employed 207,875 workers, with a

payroll of \$3.5 billion. The estimated revenues of this industry amounted to \$27.111 billion in 1994.

In view of the above, the Administrator has determined that this rule will not have a significant economic impact on a substantial number of small entities.

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